REMARKS

Applicants have amended their claims to in order to further define various aspects of the present invention. Specifically, by the present amendments claims 3, 4, 7 and 8 are being cancelled without prejudice or disclaimer; claims 1, 5 and 9-12 are being currently amended; and new claims 25-40 are being added to the application.

Claim 1 is being amended to positively recite the step of abutting an end portion in the width direction of a first hollow shape member against an end portion in the width direction in a second hollow shape member, and disposing a rotary tool on an extension of plate thickness of the second connecting plate, thereby friction stir welding the abutted region from an outer direction of thickness of the hollow shape members, the first and second hollow shape members being further defined. Claim 1 has been further amended to clarify the various components of the first and second hollow shape members. Claims 5 and 6 are being amended to be dependent on new claim 33 (discussed infra), with claim 5 being further amended to recite that the recessed portion and the projection are disposed within the range of diameter of a small-diameter portion of the rotary tool being inserted to the plates upon performing the friction stir welding, and with claim 6 being further amended to recite that the central axis of the rotary tool is disposed within the range of depth of the recessed portion upon performing the friction stir welding.

Claim 9 has been amended to positively recite the steps of abutting an end portion in the width direction of a first hollow shape member against an end portion in the width direction of a second hollow shape member, and performing friction stir welding of the first and second hollow shape members where they abut each other, to weld the abutted regions; with the grooves and the projections of the first and

second hollow shape members being further defined. Claims 10-12 are being amended in light of amendments to claim 9.

Of newly added claims 25-40, which are all directed to a friction stir welding method, claims 33 and 36 are independent claims.

Claims 25 and 26, each dependent on claim 1, respectively recites that each recessed portion includes a protruded block, with the protruded blocks supporting respective face plates of the second hollow shape member; and recites that the second hollow shape member does not have a connecting plate substantially orthogonal to the two face plates of the second hollow shape member, at the end portion thereof. Claims 27 and 28, each also dependent on claim 1, recites that in the abutting, end surfaces of the face plates are disposed substantially on an extension of the center line of the thickness of the second connecting plate; and recites that thickness of the face plates of the first hollow shape member is greater at the abutted portions of the first hollow shape member to the second hollow shape member than at other portions thereof. Claims 29 and 30, each dependent on claim 1, respectively recites that in the disposing of the rotary tool, the central axis of the rotary tool is positioned on an extension of plate thickness of the second connecting plate; and recites that the rotary tool includes small- and large-diameter portions, the small-diameter portion extending beyond the large-diameter portion, and with the rotary tool being disposed such that the small-diameter portion is inserted to a depth beyond the bottom surface of the recessed portion. Claims 31 and 32, dependent respectively on claims 1 and 25, respectively recites that the rotary tool is disposed such that during the friction stir welding the projections are plasticized, and recites that the rotary tool is disposed such that during the friction stir welding each protruded block is plasticized.

Claim 33 defines a friction stir welding method including abutting end portions of first and second plates, in the width direction, against each other, and disposing a rotary tool so as to perform friction stir welding at the abutting end portions of the first and second plates by inserting the rotary tool at the abutting end portion from the outer direction of thickness of the first and second plates, the rotary tool being inserted such that a small-diameter portion of the rotary tool extends beyond a bottom surface of the recessed portion, with the first and second plates, and the abutting being further defined. That is, the first plate is defined as including one end having a recessed portion opening outward toward both the width and thickness directions of the first plate, and the second plate is defined as including one end having a projection protruding outward to the width direction of the second plate, the projection of the second plate being inserted to the recessed portion of the first plate when performing the abutting. Claims 34 and 35, each dependent on claim 33, respectively recites that the first plate further has a groove portion opening outwardly in the width direction of the first plate, with the groove opening into the recessed portion, and with the projection being inserted to the groove portion when performing the abutting; and recites that both the groove portion and the projection have trapezoidal shapes.

New independent claim 36 recites a friction stir welding method including abutting end portions of first and second plates, in the width direction, against each other, and disposing a rotary tool so as to perform friction stir welding at the abutting end portions of the first and second plates by inserting the rotary tool at the abutting end portions from the outer direction of thickness of the first and second plates, the first and second plates, and the abutting, being further defined. That is, claim 36 recites that the first plate includes one end having a groove portion opening outward

toward the width direction of the first plate, and the second plate includes one end having a projection protruding outward in the width direction of the second plate, the projection of the second plate being inserted to the groove portion of the first plate when performing the abutting. Claim 37, dependent on claim 36, recites that one of the first and second plates further includes a recessed portion opening both outwardly in the width direction and upwardly in the thickness direction, the groove portion being positioned in the recessed portion where the first plate includes the recessed portion, and the projection being positioned in the recessed portion where the second plate includes the recessed portion; and claim 38, dependent on claim 37, recites that the other of the first and second plates, other than the one of the first and second plates, does not have a recessed portion, and the other of the first and second plates is positioned in the recessed portion during the abutting. Claims 39 and 40, dependent respectively on claims 37 and 36, respectively recites that the rotary tool is inserted to a depth beyond a depth of the lower surface of the recessed portion, and recites that each of the projection and groove portion has a trapezoidal shape.

In connection with amendments to the previously considered claims as well as in connection with the newly added claims, note, for example, pages 9-16 of Applicants' specification.

The provisional rejection of claims 1-5 and 8-10 under the judicially created doctrine of obviousness-type double patenting, over claims 3 and 10-13 of copending Application No. 10/066,674, set forth in Item 2 on pages 2 and 3 of the Office Action mailed April 30, 2003, is noted. Being filed concurrently herewith is a Express Abandonment of copending Application No. 10/066,674. In view of this

Express Abandonment of No. 10/066,674, it is respectfully submitted that the obviousness-type double patenting rejection is moot.

Applicants respectfully submit that all of the claims pending in the above-identified application patentably distinguish over the teachings of the references applied by the Examiner in the Office Action mailed April 30, 2003, that is, the teachings of U.S. Patent No. 6,413,610 to Nakamura, et al., U.S. Patent No. 6,321,975 to Kawasaki, et al., and U.S. Patent Publication No. US 2001/0015370 to Matsunaga, et al., under the provisions of 35 U.S.C. § 102 and 35 U.S.C. § 103.

Initially, it is noted that the applied prior art and the above-identified application have a common assignee, this common assignee being a common assignee as of the date of the invention claimed in the above-identified application. Noting that the Examiner has applied each of Nakamura, et al., Kawasaki, et al. and Matsunaga, et al. as prior art under 35 U.S.C. § 102(e), and that the above-identified application has a U.S. filing date of January 25, 2002, it is respectfully submitted that, as applied by the Examiner, Nakamura, et al., Kawasaki, et al. and Matsunaga, et al. are disqualified as prior art under 35 U.S.C. § 103.

In any event, noting the publication/patenting date of Matsunaga, et al. of August 23, 2001, and of Kawasaki, et al. of November 27, 2001, which are after the filing date of the Japanese priority application for the above-identified application, upon filing an English translation of the Japanese priority application for the above-identified application, with a statement of accuracy of such translation, it is respectfully submitted that Matsunaga, et al. and Kawasaki, et al. are disqualified as prior art under 35 U.S.C. § 103.

In any event, it is respectfully submitted that the teachings of the applied references do not disclose, nor would have suggested, such a friction stir welding

method as in the present claims, including abutting end portions of the specifically defined first and second hollow shape members as in, for example, in claims 1 and 9, and disposing the rotary tool (or performing friction stir welding).

More specifically, it is respectfully submitted that these references do not disclose, nor would have suggested, such friction stir welding method of the first and second hollow shape members, with the first hollow shape member including, inter alia, a second connecting plate for connecting the end portions of the face plates that is disposed substantially orthogonal to the face plates, recessed portions formed respectively to connecting portions where the two face plates of the first hollow shape member are each connected with the second connecting plate, each recessed portion opening outward toward the width direction and the thickness direction of the hollow shape member, with a groove or projection formed to one recessed portion and a groove or projection formed to the other recessed portion; and wherein the second hollow shape member includes, inter alia, a projection or groove formed to one face plate at the end portion of the second hollow shape member and a projection or groove formed to the other face plate at the other end portion of the second hollow shape member, with the projections each being inserted to a corresponding groove, when the abutting is performed. Moreover, theses references would neither have disclosed nor would have suggested the disposing of the rotary tool on an extension of plate thickness of the second connecting plate. See claim 1.

Also more specifically, it is respectfully submitted that these applied references would have neither disclosed nor would have suggested the method of claim 9, including wherein the first hollow member includes a groove opening toward the width direction or a projection protruding toward the width direction, and the second hollow shape member includes either a projection or groove, and wherein

during the abutting the projections are each inserted to a corresponding groove when the two hollow shape members are abutted against each other.

Furthermore, it is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a friction stir welding method as in the present claims, including wherein an end potion in the width direction of a first plate is abutted against an end portion in the width direction of a second plate, the first and second plates being further defined and the abutting being further defined; and disposing a rotary tool so as to perform friction stir welding at the abutting end portions of the first and second plates by inserting the rotary tool at the abutting end portions from the outer direction of thickness of the first and second plates, the rotary tool being inserted such that a smaller-diameter portion of the rotary tool extends beyond a bottom surface of the recessed portion, the first and second plates being further defined and the abutting being further defined. More specifically, these applied references would have neither taught nor would have suggested such friction stir welding method, wherein the first plate includes one end having a recessed portion opened outward toward both the width and the thickness directions of the first plate, the second plate including one end having a projection protruding outward to the width direction of the second plate, and with the projection of the second plate being inserted to the recessed portion of the first plate when performing the abutting. See claim 33. Note also claim 39, with respect to the rotary tool extending beyond a bottom surface of the recessed portion.

In addition, it is respectfully submitted that these applied references would have neither disclosed nor would have suggested such a friction stir welding method as in the present claims, including abutting end portions, in the width direction, of first and second plates against each other, the first and second plates, and abutting, be

further defined; and disposing a rotary tool so as to perform friction stir welding at abutting end portions of the first and second plates by inserting the rotary tool at the abutting end portions from the outer direction of thickness of the first and second plates. More specifically, these references would have neither disclosed nor would have suggested such method, wherein the first plate includes one end having a groove portion opening outward toward the width direction of the first plate and the second plate including one end having a projection protruding outward in the width direction of the second plate, with the projection of the second plate being inserted to the grooved portion of the first plate when performing the abutting. See claim 36.

Moreover, it is respectfully submitted that these applied references would have neither disclosed nor would have suggested such a friction stir welding method including use of the first and second plates, and wherein one of the first and second plates has the recessed portion, and the plates respectively have the projection and grooved portions, as set forth in claims 34 and 37.

Furthermore, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested the aspects of the present invention as set forth in the remaining, dependent claims. More specifically, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such a friction stir welding method, having features discussed previously, and further including (but not limited to) wherein the recessed portion and projection are disposed within a range of diameter of a small-diameter portion of the rotary tool being inserted to the plates upon performing the friction stir welding (See claim 5); and/or wherein the contra axis of the rotary tool is disposed within the range of depth of the recessed portion upon performing the friction stir welding (see claim 6); and/or wherein the groove and

projection are disposed within a range of diameter of a small-diameter portion of the rotary tool inserted to the first and second hollow shaped members upon performing the friction stir welding (see claim 10) and/or wherein the central axis of the rotary tool is disposed within a range of depth of the groove upon performing the friction stir welding (see claims 11 and 12); and/or wherein each recessed portion includes a protruded block, with the protruded blocks supporting respective face plates of the second hollow shape member (see claim 25); and/or wherein the second hollow shape member does not have a connecting plate substantially orthogonal to the two face plates of the second hollow shape member, at the end portion thereof (see claim 26); and/or relative positioning of end surfaces of the face plates relative to an extension of the center line of the thickness of the second connecting plate as in claim 27; and/or relative positioning of the central axis of the rotary tool to an extension of plate thickness of the second connecting plate as in claim 29; and/or wherein a small-diameter portion of the rotary tool is inserted to a depth beyond the bottom surface of the recessed portion when disposing the rotary tool (see claim 30); and/or specific portions of the members plasticized during the friction stir welding as in claims 31 and 32; and/or wherein both the groove portion and projection have trapezoidal shapes as in claims 35 and 40; and/or wherein the other of the first and second plates, other than the one of the first and second plates having the recessed portion, does not have a recessed portion, with this other of the first and second plates being positioned in the recessed portion during the abutting (see claim 38).

The present invention as presently claimed in the above-identified application is directed to a friction stir welding method, particularly suitable for welding hollow shape members, which can provide a good friction stir weld without deformation of the members being welded during the friction stir welding, while avoiding unduly

adding weight to the structure formed due to a disadvantageously large number of supporting ribs. According to the present invention, movement of the members being welded in the thickness direction of the members can be at least suppressed, notwithstanding softening of the members by the frictional heat generated by the frication stir welding, by the present structure where the projections are used, particularly where such projections fit into the grooves of the adjacent member. According to the present method, less work is required to cut off any uneven bumps formed after the friction stir welding to the joint region. Accordingly, the present invention achieves a relatively low cost. Moreover, it is possible to omit in advance a connecting plate disposed on the end region of both hollow shape members, orthogonal to the face plates; and, thus, a lightweight structure can be manufactured. Note, for example, the paragraph bridging pages 14 and 15, and the first full paragraph on page 15, of Applicants' specification.

It is emphasized that according to the present invention projections extending beyond the end of one of the two plate members is used, in order to avoid the deformation. As will be shown in the following, it is respectfully submitted that the teachings of the prior art do not disclose, nor would have suggested, such projection extending beyond the end, much less such projection in combination with the other structure of the members abutted, according to the present invention, and advantages achieved due to the use of such members in the recited friction stir welding method.

Matsunaga et al discloses a friction stir welding method of a hollow shape extruded frame member. The method is characterized in that in a rear face of a welding portion of a first member which is put on a frame stand and a second member for welding the first member, a backing plate is arranged in a space

between the face plates, from an outer portion of this space, by forming the backing plate and frame stand as a support member; carrying out a friction stir welding to the first and second members; and removing the backing plate from the space. See paragraph [0008]. Note also paragraphs [0027], [0028] and [0030] on page 2 of this published application. Note also paragraph [0044] on page 3 of this published application.

It is respectfully submitted that Matsunaga, et al. discloses relatively complex structure including use of a removable backing plate for providing support for the friction stir welding. It is respectfully submitted that this references does not disclose, nor would have suggested, the structure as in the present claims, including the projections protruding outward to the width direction, more particularly wherein such projections are inserted to the recessed/groove portion when performing the abutting, as in the present invention.

In addition, it is respectfully submitted that this references does not disclose, nor would have suggested, such method as in the present claims, including, inter alia, wherein the rotary tool is inserted such that a smaller-diameter portion thereof extends beyond a bottom surface of the recessed portion, providing a good friction stir weld as achieved according to the present invention and discussed in the foregoing.

Nakamura, et al. discloses a manufacturing method of a structure body. The method is described, for example, in the paragraph bridging columns 2 and 3 of this patent, and includes use of first and second hollow frame members described from column 2, line 61 to column 3, line 2. Note also the last paragraph in column 4, column 5, lines 7-36; column 6, lines 17-35; column 6, and line 65 to column 7, line 5.

It is respectfully submitted that Nakamura, et al. is particularly directed to providing structure with no ribs substantially orthogonal to the face plates. It is respectfully submitted that Nakamura, et al. would have neither disclosed nor would have suggested, and would have taught away from, the presently claim method as in, for example, claim 1, having the second connecting plate.

Moreover, it is noted that according to Nakamura, et al. the face plate has an end portion extending beyond the end of the other face plate of the hollow frame member. It is respectfully submitted that this teaching of Nakamura, et al. would have neither disclosed nor would have suggested the projections extending beyond the ends of the plate, as in the present invention, much less relationship thereof to the recessed portions and/or groove portions, particularly insertion thereof which avoids deformation notwithstanding plasticizing of the material at the welding portion during the friction stir welding, as discussed in the foregoing.

Kawasaki, et al. discloses a manufacturing method of a structure body by a friction stir welding technique, including providing a hole on the member to be subjected to the joining which is located at the position where the friction stir welding starts; and after the rotary tool is inserted to this hole the rotary tool is moved along the joint line. This patent discloses that since the force is primarily large during the initial time of insertion of the rotary tool, by the use of the hole reduction of the insertion force can be achieved. See column 2, lines 7-12. Note also the paragraph bridging columns 2 and 3, as well as column 3, lines 7-15.

It is respectfully submitted that Kawasaki, et al. discloses a relatively complex technique in which additional steps of providing a hole, with the rotary tool initially being inserted in this hole, is required, for avoiding deformation. As can be seen, for example, in Fig. 1 of Kawasaki, et al., each of the members being welded includes

substantially orthogonal connecting ribs at the end portions of the members being friction stir welded. Moreover, as can be seen in Fig. 2 of Kawasaki, et al., this patent has the hole provided in a tabular portion extending beyond the end of the members being welded, requiring additional steps, for example, of removal of such end portions. It is respectfully submitted that Kawasaki, et al. discloses ends or ends of the face plates overlapping the projection chips 36, 36. It is respectfully submitted that this reference does not disclose, nor would have suggested, the method according to the present invention, including wherein the projections are inserted into the recessed portions during the abutting, as in various of the claims. Moreover, it is respectfully submitted that this references does not disclose, nor would have suggested, the groove portions; and it is respectfully submitted that this reference would have neither disclosed nor would have suggested the relatively simple structure being friction stir welded according to the present invention, including the projections, and recessed portions and/or groove portions, much less relationship therebetween during the abutting, avoiding deformation as discussed previously.

The contention by the Examiner that each of Matsunaga, et al., Kawasaki, et al., and Nakamura, et al. discloses a technique wherein the plates and members are connected to connecting members comprising grooves and projections which are interlocked when the members are placed in abutment, is respectfully traversed. The Examiner is respectfully requested to specifically point out the grooves and projections in each of these references. That is, it is respectfully submitted that these references do not disclose, nor would have suggested, projections extending outward from ends of the members, as in the present claims, being inserted into recessed portions and/or grooves as in the present invention, and advantages thereof. Moreover, it is respectfully submitted that these references do not disclose,

nor would have suggested, grooves, much less insertion of projections into the grooves, as in various of the present claims. Furthermore, these references do not disclose, nor would have suggested, the projections, recessed portions and grooves and relationships therebetween, as in various of the present claims.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently pending in the application are respectfully requested.

If the Examiner believes that there are any other points which may be clarified or otherwise disposed of either by telephone discussion or by personal interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account No. 01-2135 (Case No. 648.41111X00), and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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